REMARKS

Claims 1-24 are pending in the present application. Claims 1, 6, 7, 8, 13, 14, 15, 20, 21 and 24 are amended to clarify the claims. Claims 25, 26 and 27 are added. Support for the amendments to claims 1, 6, 7, 8, 13, 14, 15, 20 and 21 may be found at least on page 13, line 4, through page 15, line 10 of the present specification. Support for the amendment to claim 24 may be found at least on page 10, line 23 through page 11, line 8 of the present specification. Support for new claim 25 may be found at least on page 17, lines 3-10 of the present specification. Reconsideration of the claims is respectfully requested.

Amendments are made to the specification to include the missing reference numbers '317' in Figure 3 and '514' in Figure 5 from the drawings as suggested by the Examiner. No new matter has been added by any of the amendments to the specification.

I. 35 U.S.C. § 112, Second Paragraph

The Office Action rejects claims 1-24 under 35 U.S.C. § 112, second paragraph, as being allegedly indefinite for failing to particularly point out and distinctly claim the subject matter, which applicants regard as the invention. This rejection is respectfully traversed.

Claims 1, 8 and 15 are amended by replacing "the correction history record" with "a correction history record" to provide antecedent basis for the claims. Additionally, claims 1, 8 and 15 are amended to clarify the relationships between the elements in the claims. Claims 7, 14 and 21 are amended by replacing "the number of times errors have been found" with "the number of errors found" as suggested by the Examiner to provide clarification for the claims. Claim 24 is amended to include elements of a data storage device used to read a data storage medium, as suggested by the Examiner. Therefore the rejection of claims 1-24 under 35 U.S.C. § 112, second paragraph has been overcome. Applicants respectfully request withdrawal of the rejection of claims 1-24 under 35 U.S.C. § 112, second paragraph.

II. 35 U.S.C. § 102, Alleged Anticipation Based on Inoue

The Office Action rejects claims 1-7 under 35 U.S.C. § 102(b) as being allegedly anticipated by *Inoue et al.* (U.S. Patent Number 4,336,612 A), hereinafter referred to as *Inoue*. This rejection is respectfully traversed.

As to independent claim 1, the Office Action states:

> Inoue teaches a method of correcting errors in a data storage medium having a plurality of tracks (col. 8, lines 26-68 of Inoue, Note: the PCM multi-track digital recording apparatus taught in Inoue is a data storage medium having a plurality of tracks), comprising: decoding a first quantity of data that is encoded using an error-correcting code and that spans multiple tracks from the plurality of tracks (the C1 Decoders 44 in Figure 6B of Inoue are used for decoding a first quantity of data, the C1xC2 coded data, that is encoded using the C1xC2 error-correcting code and that spans multiple tracks form the plurality of tracks); writing to ~~the~~ a corrections history record to indicate which of the multiple tracks contained errors when the first quantity of data was decoded (col. 6, lines 52-54 in Inoue teach writing error detected information to a register to indicate which of the words in the row directions, i.e., the words in the multiple tracks, contained errors when the first quantity of C1 encoded data was decoded, hence the registers are a correction history record as claimed; Note: rows of the codeword correspond to tracks in a PCM multi-track digital recording); and decoding a second quantity of data that is encoded using the error-correcting code and that spans the multiple tracks, wherein a limited number of data along the ~~of the~~ multiple tracks are decoded as erasures in accordance with the correction history record (C2 Decoder 56 in Figure 6B of Inoue is used for decoding a second quantity of data, the C2 coded data, that is derived from the originally encoded C1xC2 error-correcting code and that spans the multiple tracks, wherein a limited number of data along the ~~of the~~ multiple tracks are decoded as erasures in accordance with the correction history record; Note: words in the row directions that are labeled as erasures are words belonging to a limited number of tracks that fall within the erasure correcting ability of the code; Note also that C2 encoded data is a subset of the originally encoded C1xC2 error-correcting code, hence is a second quantity of data that is encoded using the C1xC2 error-correcting code).

Office Action dated April 9, 2004, page 5-6.

As amended, independent claim 1 reads as follows:

> 1. A method of correcting errors in a data storage medium having a plurality of tracks, comprising:
>
> decoding a first quantity of data that is encoded using an error-correcting code and that spans multiple tracks from the plurality of tracks;
>
> writing to a correction history record to indicate a first subset of tracks in the multiple tracks that contained errors when the first quantity of data was decoded; and
>
> decoding a second quantity of data that is encoded using the error-

correcting code and that spans the multiple tracks, wherein a second subset of tracks in the multiple tracks are designated as erasures in accordance with the correction history record such that not all of the multiple tracks that contained errors when the second quantity of data was decoded are present in the second subset. (emphasis added)

A prior art reference anticipates the claimed invention under 35 U.S.C. § 102 only if every element of a claimed invention is identically shown in that single reference, arranged as they are in the claims. *In re Bond*, 910 F.2d 831, 832, 15 U.S.P.Q.2d 1566, 1567 (Fed. Cir. 1990). All limitations of the claimed invention must be considered when determining patentability. *In re Lowry*, 32 F.3d 1579, 1582, 32 U.S.P.Q.2d 1031, 1034 (Fed. Cir. 1994). Anticipation focuses on whether a claim reads on the product or process a prior art reference discloses, not on what the reference broadly teaches. *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 218 U.S.P.Q. 781 (Fed. Cir. 1983). Applicant respectfully submits that *Inoue* does not identically show every element of the claimed invention arranged as they are in the claims. Specifically, *Inoue* does not teach the feature of decoding a second quantity of data that is encoded using an error-correcting code and that spans multiple tracks, wherein a second subset of tracks in the multiple tracks are designated as erasures in accordance with a correction history record such that not all of the multiple tracks that contained errors when the second quantity of data was decoded are present in the second subset.

Inoue is directed towards an encoding and decoding system with error-correcting capabilities for digital information having a two-dimensional array of $k_2 \times k_1$ bits. The two-dimensional array is divided into multiple rectangular arrays of $n_2 \times b$ bits resulting in multiple codes C_2. Each of the rows of codes C_2 is encoded into a code C_1. The codes C_1 are encoded to form a codeword of a generalized product code. Errors are detected in the codes C_1 decoded from the codeword to produce erasure information, which is utilized to correct the codes C_2. In other words, the code C_1 is used as an error detecting code so that error detected information provided by the decoding of the code C_1 is used, as erasures, in the process of decoding the codes C_2. When the code C_2 has been decoded, a C_1 decoder is operated to detect errors in the row direction. Then, error detected information is stored in

an associated register as erasures. This information indicates which of the words in the row direction has been erroneous.

In claim 1, a correction history record indicates a first subset of data tracks that contained errors when a first quantity of data was decoded. Then, a second quantity of data that spans the multiple tracks is decoded and a second subset of tracks are designated as erasures in accordance with the correction history record such that not all of the multiple tracks that contained errors when decoding the second quantity of data are present in the second subset. In other words, the correction history record indicates all tracks that contained errors during decoding. The second subset of tracks are designated as erasures in accordance with the correction history record so that not all tracks containing errors are designated as erasures. For example, tracks with the greatest number of actual error corrections may be designated as erasures and tracks with the smallest number of actual error corrections may not be designated as erasures. In claim 1, not all tracks that contain an error are designated as erasures. To the contrary, *Inoue* teaches C_1 decoder is operated to detect errors in the row direction. Then, error detected information is stored in an associated register as erasures. This information indicates which of the words in the row direction has been erroneous. Therefore, *Inoue* teaches that all errors are erasures.

In the rejection of claim 1, the Office Action refers to C_2 decoder **56** from **Figure 6B** of Inoue as teaching the step of decoding a second quantity of data. The following portion of *Inoue* describes C_2 decoder **56** from **Figure 6B**:

> Then, the C_2 decoder **56** corrects the errors for every n_2 x b bits on the basis of the received word from the received word-of-code C_2 forming circuit **54**, the erasure weight information from the erasure weight calculation circuit **50** and the erasure location information from the erasure location calculation circuit **52**.
>
> The C_2 decoder **56** executes the correction as described above f times where $f = k_1 / b$ and supplies outputs to the k_2 x k_1 information matrix reproducing circuit **60** one for every k_2 x b bits. The k_2 x k_1 information matrix reproducing circuit **60** reproduces a k_2 x k_1 information matrix and applied to; the compensation circuit **62**, the analog musical signal in the digital form including the sampled values thereof.

Inoue, column 10, lines 21-34.

Inoue teaches that the C_2 decoder **56** corrects the errors for every n_2 x b bits (code C_2) and supplies outputs to the k_2 x k_1 information matrix reproducing circuit **60**. In

Inoue, the C_2 decoder **56** does not designate a second subset of tracks in the multiple tracks as erasures. Additionally, the C_2 decoder **56** does not designate a second subset of tracks in the multiple tracks as erasures in accordance with a correction history record such that not all of the multiple tracks that contained errors when the second quantity of data was decoded are present in the second subset. Furthermore, *Inoue* teaches that all erroneous words detected by the C_1 decoder are erasures. The C_2 decoder **56** corrects the errors.

In view of the above, Applicant respectfully submits that *Inoue* does not teach each and every feature of independent claim 1 as required under 35 U.S.C § 102(b). At least by virtue of their dependency on claim 1, *Inoue* does not teach each and every feature of dependent claims 2-7. Accordingly, Applicant respectfully requests withdrawal of the rejection of claims 1-7 under 35 U.S.C § 102(b).

Additionally, *Inoue* does not teach the specific features recited in dependent claims 2-7. For example with respect to claim 6, *Inoue* does not teach selecting a second subset of tracks to be treated as erasures based upon a calculated weight for each of the multiple tracks. To the contrary, *Inoue* teaches that all erroneous words detected by the C_1 decoder are erasures rather than selecting a second subset of tracks to be treated as erasures based on a calculated weight. *Inoue* does teach calculating a weight for an erasure, but does not use the calculated weight as a basis for selecting a second subset of tracks to be treated as erasures. Thus, in addition to being dependent on independent claim 1, claim 6 is also distinguished over *Inoue* based on the specific features recited therein.

Furthermore, *Inoue* does not teach, suggest, or give any incentive to make the needed changes to reach the presently claimed invention. *Inoue* actually teaches away from the presently claimed invention because it teaches that all erroneous words detected by the C_1 decoder are erasures opposed to designating a second subset of tracks in the multiple tracks as erasures in accordance with a correction history record such that not all of the multiple tracks that contained errors when the second quantity of data was decoded are present in the second subset as in the presently claimed invention. Absent the Examiner pointing out some teaching or incentive to implement *Inoue* and designating a second subset of tracks in the multiple tracks as erasures in accordance with a correction

history record such that not all of the multiple tracks that contained errors when the second quantity of data was decoded are present in the second subset, one of ordinary skill in the art would not be led to modify *Inoue* to reach the present invention when the reference is examined as a whole. Absent some teaching, suggestion, or incentive to modify *Inoue* in this manner, the presently claimed invention can be reached only through an improper use of hindsight using the Applicants' disclosure as a template to make the necessary changes to reach the claimed invention.

III. 35 U.S.C. § 103, Alleged Obviousness Based on Inoue

The Office Action rejects claims 8-14 under 35 U.S.C. § 103(a) as being allegedly unpatentable over *Inoue et al.* (U.S. Patent Number 4,336,612 A), hereinafter referred to as *Inoue*. This rejection is respectfully traversed.

As to independent claim 8, the Office Action states:

> Inoue teaches a method of correcting errors in a data storage medium having a plurality of tracks (col. 8, lines 26-68 of Inoue, Note: the PCM multi-track digital recording apparatus taught in Inoue is a data storage medium having a plurality of tracks), comprising: decoding a first quantity of data that is encoded using an error-correcting code and that spans multiple tracks from the plurality of tracks (the C1 Decoders 44 in Figure 6B of Inoue are used for decoding a first quantity of data, the C1xC2 coded data, that is encoded using the C1xC2 error-correcting code and that spans multiple tracks form the plurality of tracks); writing to ~~the~~ a corrections history record to indicate which of the multiple tracks contained errors when the first quantity of data was decoded (col. 6, lines 52-54 in Inoue teach writing error detected information to a register to indicate which of the words in the row directions, i.e., the words in the multiple tracks, contained errors when the first quantity of C1 encoded data was decoded, hence the registers are a correction history record as claimed; Note: rows of the codeword correspond to tracks in a PCM multi-track digital recording); and decoding a second quantity of data that is encoded using the error-correcting code and that spans the multiple tracks, wherein a limited number of data along the ~~of the~~ multiple tracks are decoded as erasures in accordance with the correction history record (C2 Decoder 56 in Figure 6B of Inoue is used for decoding a second quantity of data, the C2 coded data, that is derived from the originally encoded C1xC2 error-correcting code and that spans the multiple tracks, wherein a limited number of data along the ~~of the~~ multiple tracks are decoded as erasures in accordance with the correction history record; Note: words in the row directions that are labeled as erasures are words belonging to a limited number of tracks that fall within the erasure correcting ability of the code; Note also that C2 encoded data is a subset of the originally encoded C1xC2 error-correcting code, hence is a second quantity of data that is encoded using the C1xC2 error-correcting code). However, Inoue

does not explicitly teach the specific use of computer stored instructions for implementing the method taught in the Inoue patent.

The Examiner asserts that it would have been obvious engineering design choice to select a software solution for implementing the method taught in the Inoue patent since it is well known in the art that software solutions provide an added degree of flexibility over hardware solutions.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teaching of Inoue by including use of computer stored instructions for implementing the method taught in the Inoue patent. This modification would have been obvious to one of ordinary skill in the art, at the time the invention was made, because one of ordinary skill in the art would have recognized that use of computer stored instructions for implementing the method taught in the Inoue patent would have provided the opportunity to implement the design taught in the Inoue patent based on obvious engineering design choices given a set of system requirements such as flexibility (Note: it is well known in the art that software solutions provide an added degree of flexibility over hardware solutions).

Office Action dated April 9, 2004, page 8-10.

As amended, independent claim 8 reads as follows:

8. A computer program product in a computer-readable medium, for correcting errors in a data storage medium having a plurality of tracks, comprising instructions for:

decoding a first quantity of data that is encoded using an error-correcting code and that spans multiple tracks from the plurality of tracks;

writing to a correction history record to indicate a first subset of tracks in the multiple tracks that contained errors when the first quantity of data was decoded; and

decoding a second quantity of data that is encoded using the error-correcting code and that spans the multiple tracks, wherein a second subset of tracks in the multiple tracks are designated as erasures in accordance with the correction history record such that not all of the multiple tracks that contained errors when the second quantity of data was decoded are present in the second subset. (emphasis added)

Claim 8 is a computer program product claim with similarly recited subject matter as claim 1. As discussed above, *Inoue* does not teach or suggest decoding a second quantity of data that is encoded using the error-correcting code and that spans the multiple tracks, wherein a second subset of tracks in the multiple tracks are designated as erasures in accordance with the correction history record such that not all of the multiple tracks that contained errors when the second quantity of data was decoded are present in the second subset. Thus, *Inoue* cannot teach a computer program product that has

instructions for performing these operations. Therefore, *Inoue* does not teach or suggest the features of claim 8 for similar reasons as noted above with regard to claim 1.

Since claims 9-14 depend from independent claim 8, the same distinctions between *Inoue* and the invention recited in claim 8, apply to dependent claims 9-14. In addition with respect to claim 13, *Inoue* does not teach selecting the second subset of tracks to be treated as erasures based upon the calculated weight for each of the multiple tracks. To the contrary, *Inoue* teaches that all erroneous words detected by the C_1 decoder are erasures rather than selecting a second subset of tracks to be treated as erasures based on a calculated weight. *Inoue* does teach calculating a weight for an erasure, but does not use the calculated weight as a basis for selecting a second subset of tracks to be treated as erasures. Thus, in addition to being dependent on independent claim 8, claim 13 is also distinguished over *Inoue* based on the specific features recited therein. Accordingly, Applicants respectfully request withdrawal of the rejection of claims 8-14 under 35 U.S.C. § 103(a).

IV. 35 U.S.C. § 103, Alleged Obviousness Based on Inoue and Umemura

The Office Action rejects claims 15-24 under 35 U.S.C. § 103(a) as being allegedly unpatentable over *Inoue et al.* (U.S. Patent Number 4,336,612 A), hereinafter referred to as *Inoue* in view of *Umemura et al.* (U.S. Patent Number 5,708,637 A), hereinafter referred to as *Umemura*. This rejection is respectfully traversed.

As to independent claim 15, the Office Action states:

> Inoue teaches a method of correcting errors in a data storage medium having a plurality of tracks (col. 8, lines 26-68 of Inoue, Note: the PCM multi-track digital recording apparatus taught in Inoue is a data storage medium having a plurality of tracks), comprising: decoding a first quantity of data that is encoded using an error-correcting code and that spans multiple tracks from the plurality of tracks (the C1 Decoders 44 in Figure 6B of Inoue are used for decoding a first quantity of data, the C1xC2 coded data, that is encoded using the C1xC2 error-correcting code and that spans multiple tracks form the plurality of tracks); writing to ~~the~~ a corrections history record to indicate which of the multiple tracks contained errors when the first quantity of data was decoded (col. 6, lines 52-54 in Inoue teach writing error detected information to a register to indicate which of the words in the row directions, i.e., the words in the multiple tracks, contained errors when the first quantity of C1 encoded data was decoded, hence the registers are a correction history record as claimed; Note: rows of the codeword correspond to tracks in a PCM multi-track digital recording); and decoding a second quantity

of data that is encoded using the error-correcting code and that spans the multiple tracks, wherein a limited number of data along the ~~of the~~ multiple tracks are decoded as erasures in accordance with the correction history record (C2 Decoder 56 in Figure 6B of Inoue is used for decoding a second quantity of data, the C2 coded data, that is derived from the originally encoded C1xC2 error-correcting code and that spans the multiple tracks, wherein a limited number of data along the ~~of the~~ multiple tracks are decoded as erasures in accordance with the correction history record; Note: words in the row directions that are labeled as erasures are words belonging to a limited number of tracks that fall within the erasure correcting ability of the code; Note also that C2 encoded data is a subset of the originally encoded C1xC2 error-correcting code, hence is a second quantity of data that is encoded using the C1xC2 error-correcting code). However, Inoue does not explicitly teach the specific use of computer stored instructions for implementing the method taught in the Inoue patent.

The Examiner asserts that it would have been an obvious engineering design choice to select a software solution for implementing the method taught in the Inoue patent since it is well known in the art that software solutions provide an added degree of flexibility over hardware solutions. In addition, the Examiner asserts that a tape storage device is a digital device used in data processing systems such as the one in Figure 1 of Umemura. It is obvious to use a digital device in an environment for which it is specifically designed.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the teaching of Inoue by including use of computer stored instructions for implementing the method taught in the Inoue patent. This modification would have been obvious to one of ordinary skill in the art, at the time the invention was made, because one of ordinary skill in the art would have recognized that use of computer stored instructions for implementing the method taught in the Inoue patent would have provided the opportunity to implement the design taught in the Inoue patent based on obvious engineering design choices given a set of system requirements such as flexibility (Note: it is well known in the art that software solutions provide an added degree of flexibility over hardware solutions).

Office Action dated April 9, 2004, page 12-14.

As amended, independent claim 15 reads as follows:

15. A data processing system for correcting errors in a data storage medium having a plurality of tracks, comprising:

a bus system;

a processing unit having at least one processor and connected to the bus system;

memory connected to the bus system; and

a set of instructions in the memory, wherein the processing unit executes the set of instructions to perform the acts of:

decoding a first quantity of data that is encoded using an error-correcting code and that spans multiple tracks from the plurality of tracks;

> writing to a correction history record to indicate a first subset of tracks in the multiple tracks that contained errors when the first quantity of data was decoded; and
>
> decoding a second quantity of data that is encoded using the error-correcting code and that spans the multiple tracks, wherein a second subset of tracks in the multiple tracks are designated as erasures in accordance with the correction history record such that not all of the multiple tracks that contained errors when the second quantity of data was decoded are present in the second subset. (emphasis added)

Neither *Inoue*, *Umemura*, or the alleged combination of *Inoue* and *Umemura*, teach or suggest decoding a second quantity of data that is encoded using the error-correcting code and that spans the multiple tracks, wherein a second subset of tracks in the multiple tracks are designated as erasures in accordance with the correction history record such that not all of the multiple tracks that contained errors when the second quantity of data was decoded are present in the second subset.

Claim 15 is a data processing system claim with similarly recited subject matter as claim 1. As discussed above, *Inoue* does not teach or suggest decoding a second quantity of data that is encoded using the error-correcting code and that spans the multiple tracks, wherein a second subset of tracks in the multiple tracks are designated as erasures in accordance with the correction history record such that not all of the multiple tracks that contained errors when the second quantity of data was decoded are present in the second subset. Further, *Umemura* does not teach or suggest this feature. Thus, *Inoue* cannot teach a data processing system for performing these operations. Therefore, *Inoue* does not teach or suggest the features of claim 15 for similar reasons as noted above with regard to claim 1.

Umemura is directed towards a signal reproducing method and apparatus for reading out recorded data from a recording medium and reproducing the data. Time for reading out data can be varied whenever a particular series of data recorded on the recording medium is written into the system to minimize data loss. *Umemura* is cited for teaching computer-stored instructions. *Umemura* does not teach or suggest decoding a second quantity of data that is encoded using the error-correcting code and that spans the multiple tracks, wherein a second subset of tracks in the multiple tracks are designated as erasures in accordance with the correction history record such that not all of the multiple

tracks that contained errors when the second quantity of data was decoded are present in the second subset. Furthermore, *Umemura* not teach or suggest designating data tracks as erasures and does not even mention the word "erasure". Thus, any alleged combination of *Umemura* with *Inoue* still would not result in the invention recited in claim 15.

Since claims 16-24 depend from independent claim 15, the same distinctions between *Inoue*, *Umemura*, and the invention recited in claim 15, apply to dependent claims 16-24. In addition, *Inoue*, *Umemura*, or the alleged combination of *Inoue* and *Umemura*, do not teach or suggest that selecting the second subset of tracks to be treated as erasures based upon the calculated weight for each of the multiple tracks, as recited in dependent claim 20. To the contrary, *Inoue* teaches that all erroneous words detected by the C_1 decoder are erasures rather than selecting a second subset of tracks to be treated as erasures based on a calculated weight. *Inoue* does teach calculating a weight for an erasure, but does not use the calculated weight as a basis for selecting a second subset of tracks to be treated as erasures. As discuss above, *Umemura* does not mention the word "erasures". Thus, in addition to being dependent on independent claim 15, claim 20 is also distinguished over *Inoue* and *Umemura* based on the specific features recited therein. Accordingly, Applicants respectfully request withdrawal of the rejection of claims 15-24 under 35 U.S.C. § 103(a).

V. New Claims 25, 26 and 27

In addition to the above, *Inoue* does not teach the specific features recited in new dependent claims 25, 26 and 27. Specifically, *Inoue* does not teach or suggest removing a data track from the second subset based on a calculated weight for the data track when a quantity of erasures and errors eliminates an ability to correct errors. As discussed previously, *Inoue* teaches that all erroneous words are erasures. *Inoue* does not teach or suggest designating a second subset of tracks as erasures or removing a data track from the second subset based on a calculated weight. Thus, in addition to being dependent on independent claims 1, 8 and 15, respectively, claims 25, 26 and 27 are also distinguished over *Inoue* based on the specific features recited therein.

VI. Conclusion

It is respectfully urged that the subject application is patentable over the cited references and is now in condition for allowance. The Examiner is invited to call the undersigned at the below-listed telephone number if in the opinion of the Examiner such a telephone conference would expedite or aid the prosecution and examination of this application.

Respectfully submitted,

DATE: July 9, 2004

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